

AMENDMENTS TO THE CLAIMS

This listing of claims replaces all prior versions of claims in the application.

1. – 23. (Cancelled).

24. (Previously Presented): A communication control system for controlling communications performed between a plurality of communication stations that are connected to communication paths being multiplexed with a main path and a sub-path, the communication control system comprising:

first communication function implementing sections which are multiplexed so as to correspond with the main path and the sub-path respectively, and each of which is configured to implement a communication function in a physical layer of an OSI hierarchical model;

second communication function implementing sections which are multiplexed so as to correspond with the multiplexed first communication function implementing sections respectively, and each of which is configured to implement a communication function in a data link layer of the OSI hierarchical model;

a high-priority communication section configured to perform a high-priority communication via the first communication function implementing section and the second communication function implementing section each corresponding to any one of the multiplexed communication paths; and

a low-priority communication section configured to perform a low-priority communication via the first communication function implementing section and the second communication function implementing section each corresponding to the sub-path,

wherein the high-priority communication section and the low-priority communication section coexist in a single communication station,

wherein the second communication function implementing section includes:

an address storing section configured to store MAC addresses corresponding to the high-priority communication section and the low-priority communication section respectively;

a transmitting section configured to attach the corresponding MAC address to a communication frame depending on whether a transmission requestor is the high-priority communication section or the low-priority communication section, and configured to transmit the communication frame to the communication path; and

a receiving section configured to compare a destination MAC address of a communication frame received from the first communication function implementing section with the MAC address stored in the address storing section, and when a match is found in the comparison result, configured to send the received communication frame to the corresponding communication section,

wherein a router configured to perform a path control of the communication path in accordance with Internet Protocol is provided on the communication path, and the communication path includes a plurality of sub-networks being interconnected by the router, and

wherein a sole master station exists on the sub-network,

the master station transmits an inter-network diagnosing frame including path state information on the paths between the home station and all another communication stations existing on the sub-network to which the home station belongs and path state information on the path between the home station and a master station existing on a sub-network to which the home station does not belong, and

each of all communication stations on the plurality of sub-networks including the master station and the other communication stations includes:

a path state storing section configured to store path state information indicating whether the communication path from the home station to each of another communication stations is sound;

a diagnosing message receiving section configured to register in the path state storing section the path state between the home station and the communication station existing on the sub-network to which the home station does not belong, based on the path state information included in the inter-network diagnosing frame; and

a data transmitting section configured to select either the main path or the sub-path in accordance with the information in the path state storing section, and performs transmission of data.

25. (Previously Presented): The communication control system according to claim 24 or 34, further comprising:

a selecting section configured to generate a list of network addresses of all communication stations existing on the sub-network, and in a case where an address of the home

station is the address that is uniquely determined among the list based on a predetermined condition, configured to cause the home station to operate as the master station on the sub-network.

26. (Currently Amended): The communication control system according to ~~claims 8, 13, 15, 17, 18, 20,~~ claim 24 or 34, wherein the high-priority communication section is configured to perform communication in accordance with a protocol dedicated to process control, and

the low-priority communication section is configured to perform communication in accordance with an open standard protocol.

27. (Currently Amended): The communication control system according to ~~claims 8, 13, 15, 17, 18, 20,~~ claim 24 or 34, wherein the high-priority communication section is configured to transfer at least one of process data, an operation amount and an alarm, and

the low-priority communication section is configured to perform at least one of image data transfer, file transfer and message transfer.

28. – 33. (Cancelled).

34. (Previously Presented): A communication control system for controlling communications performed between a plurality of communication stations that are connected to communication paths being multiplexed with a main path and a sub-path, the communication control system comprising:

a high-priority communication section configured to perform a high-priority communication normally via the main path;

a low-priority communication section configured to perform a low-priority communication via the sub-path;

a path diagnosing section configured to diagnose a soundness of the main path and the sub-path; and

a switching section configured to switch the communication path of the high-priority communication to the sub-path when the main path is diagnosed as faulty as a result of diagnosis by the path diagnosing section,

wherein the path diagnosing section includes:

a path state storing section configured to store path state information of a path state from a home station to each communication station; and

a fixed-cycle path diagnosing section configured to diagnose the communication path from the home station to each communication station in a fixed cycle,

wherein the fixed-cycle path diagnosing section is configured to register the path state information obtained from the diagnosis result, in the path state storing section,

wherein the fixed-cycle path diagnosing section is configured to broadcast a path diagnosis packet in accordance with a multicast protocol of Internet Protocol,

wherein different IP multicast addresses are assigned to the main path and the sub-path respectively,

wherein each communication station is configured to perform broadcasting by using the IP multicast address corresponding to a path selected between the main path and the sub-path, as a destination IP address, and is configured to receive a path diagnosis packet of which destination IP address matches with the IP multicast address corresponding to each of the main path and the sub-path,

wherein a router for performing a path control of the communication path in accordance with Internet Protocol is provided on the communication path, and the communication path includes a plurality of sub-networks being interconnected by the router,

wherein a sole master station exists on the sub-network,

wherein the master station is configured to transmit an inter-network diagnosing frame including path state information on the paths between the home station and all another communication stations existing on the sub-network to which the home station belongs and path state information on the path between the home station and a master station existing on a sub-network to which the home station does not belong, and

wherein each of all communication stations on the plurality of sub-networks including the master station and the other communication stations includes:

a path state storing section configured to store path state information indicating whether the communication path from the home station to each of another communication stations is sound;

a diagnosing message receiving section configured to register in the path state storing section the path state between the home station and the communication station existing on the

sub-network to which the home station does not belong, based on the path state information included in the inter-network diagnosing frame; and

a data transmitting section configured to select either the main path or the sub-path in accordance with the information in the path state storing section, and performs transmission of data.

35. – 36. (Cancelled).